

Holographic Lithography of Yablonovite-like Photonic Crystals

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Four-beam holographic lithography [1,2] is a promising technique for fabricating large-scale three-dimensional (3D) Photonic Crystals. Only recently, we [3] and another group [4] have identified parameters for the experimentally preferable "umbrella" geometry leading to a complete 3D photonic band gap (5.8% gap/midgap ratio) after silicon backfilling (same space group as the celebrated Yablonovite structure). Ref. [4] has also shown SEM micrographs but no optical spectra have been published so far. Here, following along the lines of our Ref. [3], we further explore the parameter space using crystallographic space group analysis. We indeed find parameters that lead to a slight increase of the above band gap. Furthermore, we find that this optimum parameter choice is fairly robust in terms of deviations from the ideal. Using beam parameters corresponding to optimized interference contrast [3] and 532-nm exposure wavelength, we have fabricated three-dimensional Photonic Crystal templates (see figure). Optical characterization is in progress.

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